Small Business Innovation Research/Small Business Tech Transfer

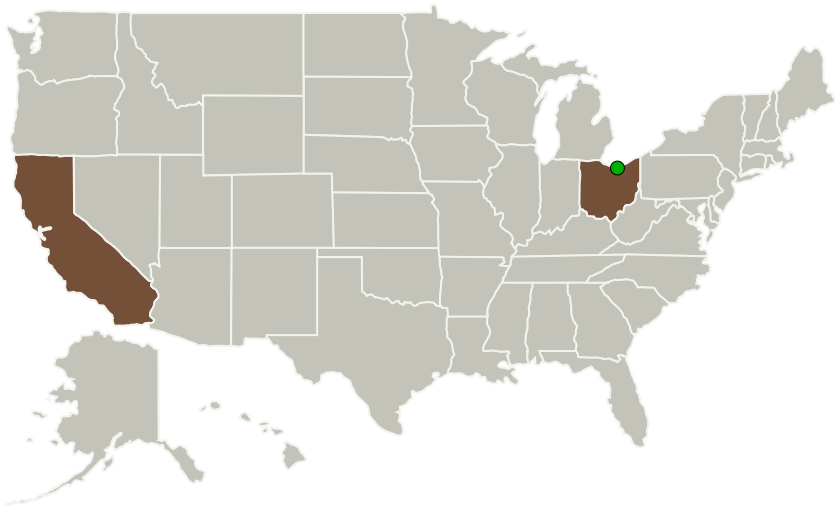
Micropump for MON-25/MMH Propulsion and Attitude Control, Phase I

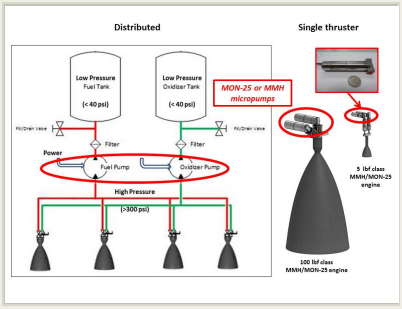
Completed Technology Project (2015 - 2015)

Project Introduction

Flight Works is proposing to expand its work in micro-gear-pumps for hypergolic and "green" propellants and team with Aerojet-Rocketdyne in order to develop and demonstrate a micropump for MON-25 and mono methyl hydrazine (MMH) bipropellant thrusters. MON-25, with 25% of nitric oxide (NO) and 75% nitrogen tetroxide (NTO, N2O4), allows lowering the oxidizer freezing point to -55 C, which is a close match to that of the fuel, MMH (which is around -51 C). While toxic, this propellant combination is hypergolic and allows operations over a wide range of temperatures, particularly in extremely cold environments as those envisioned for many future missions. The introduction of a micropump in the propulsion system provides many benefits, including the elimination of the pressurization systems; lighter, cheaper, and conformal tanks; improved system packaging; removal of propellant cross-contamination in the pressurization system; and long term storage for extended duration missions (since the loss of helium is no longer a concern). Under a Phase I SBIR, Flight Works Inc. is prepared to develop and characterize a micropump suitable for both MMH and MON-25, initially sized for 22-30 N (5-7 lbf) class thrusters with approximately 2.5 MPa (365 psi) inlet pressure, with the goal of demonstrating the technology with pump-fed MMH/MON-25 hot fire tests by the end of Phase II.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Flight Works, Inc.	Lead Organization	Industry	Irvine, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

June 2015: Project Start

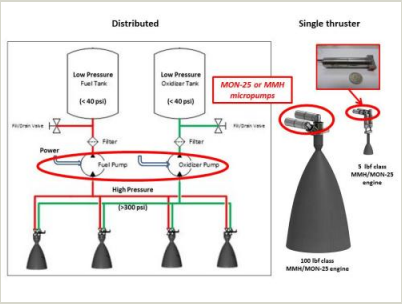
December 2015: Closed out

Closeout Summary: Micropump for MON-25/MMH Propulsion and Attitude Cont rol, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139101)*

Images



Briefing Chart Image
Micropump for MON-25/MMH Propulsion and Attitude Control, Phase I
(https://techport.nasa.gov/image/126187)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Flight Works, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

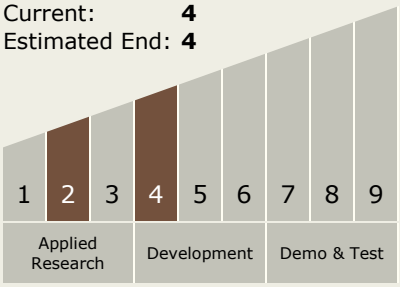
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Nadim R Eid

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Completed Technology Project (2015 - 2015)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.2 Earth Storable

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System